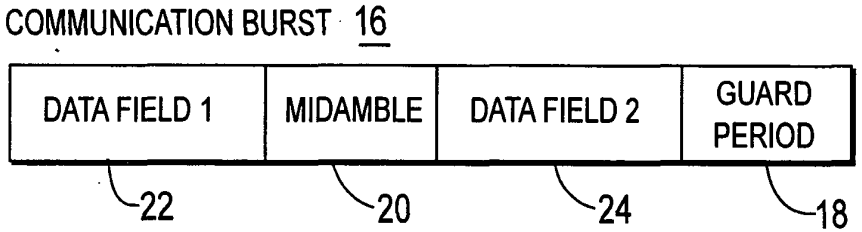
COMMUNICATION BURST 16
DATA FIELD 1
MIDAMBLE
DATA FIELD 2
GUARD PERIOD
22
20
24
18

FIG. 1

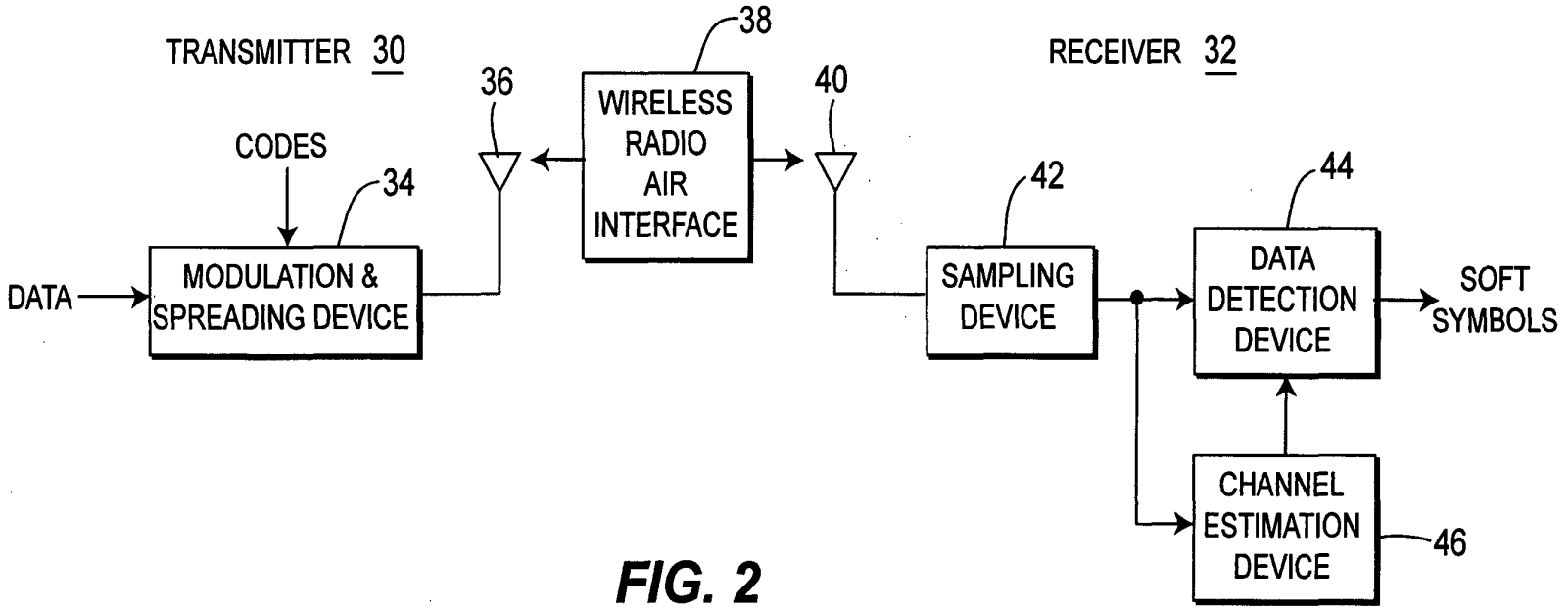
TRANSMITTER 30
RECEIVER 32
CODES
34
36
38
40
42
44
DATA
MODULATION & SPREADING DEVICE
WIRELESS RADIO AIR INTERFACE
SAMPLING DEVICE
DATA DETECTION DEVICE
SOFT SYMBOLS
CHANNEL ESTIMATION DEVICE
46

FIG. 2

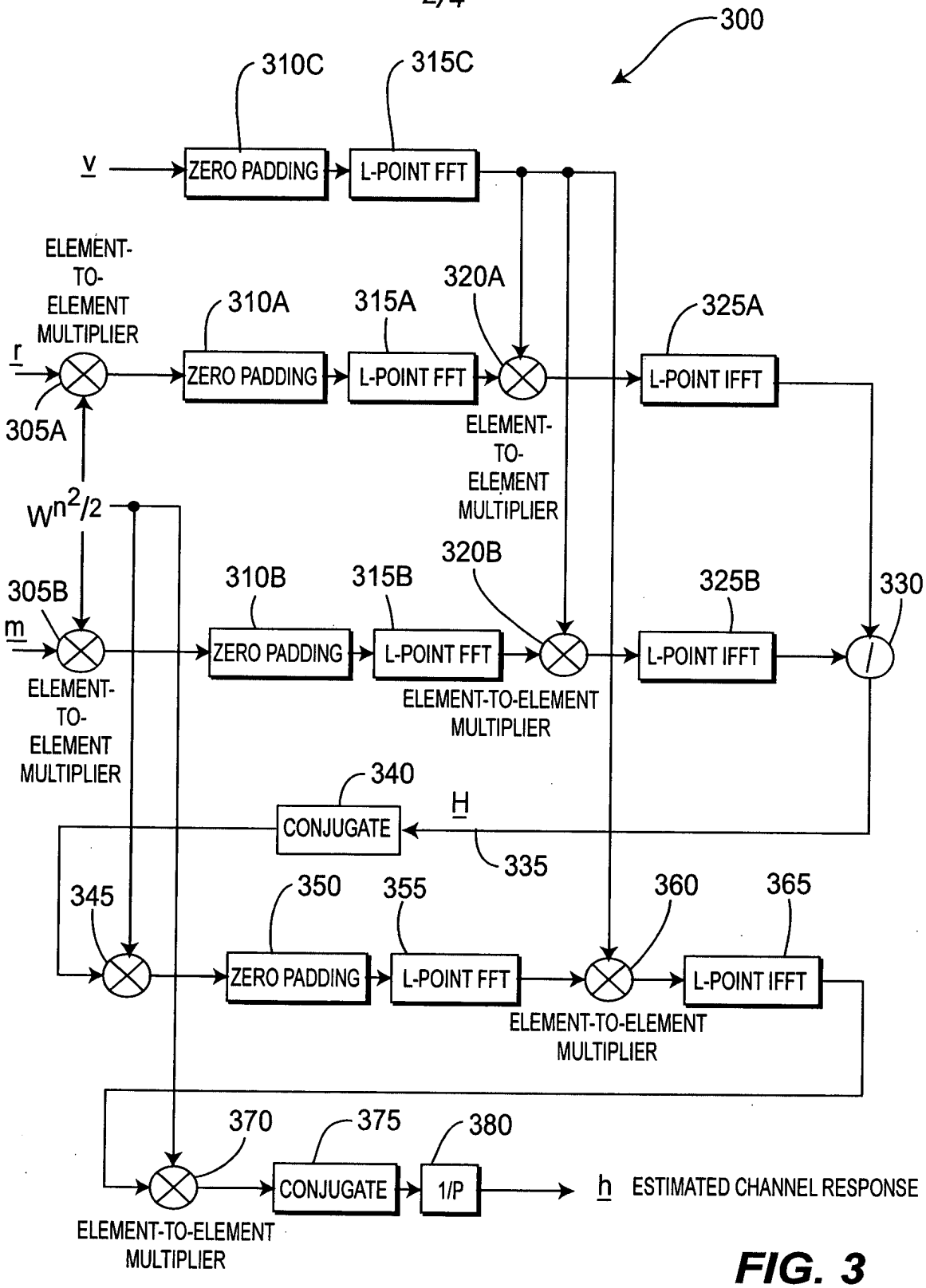
300
310C
315C
v
ZERO PADDING
L-POINT FFT
ELEMENT-TO-ELEMENT MULTIPLIER
320A
310A
315A
325A
r
ZERO PADDING
L-POINT FFT
L-POINT IFFT
305A
ELEMENT-TO-ELEMENT MULTIPLIER
$W^{n^2/2}$
320B
310B
315B
325B
330
305B
m
ZERO PADDING
L-POINT FFT
L-POINT IFFT
ELEMENT-TO-ELEMENT MULTIPLIER
ELEMENT-TO-ELEMENT MULTIPLIER
340
H
CONJUGATE
335
345
350
355
360
365
ZERO PADDING
L-POINT FFT
L-POINT IFFT
ELEMENT-TO-ELEMENT MULTIPLIER
370
375
380
CONJUGATE
1/P
h ESTIMATED CHANNEL RESPONSE
ELEMENT-TO-ELEMENT MULTIPLIER

FIG. 3

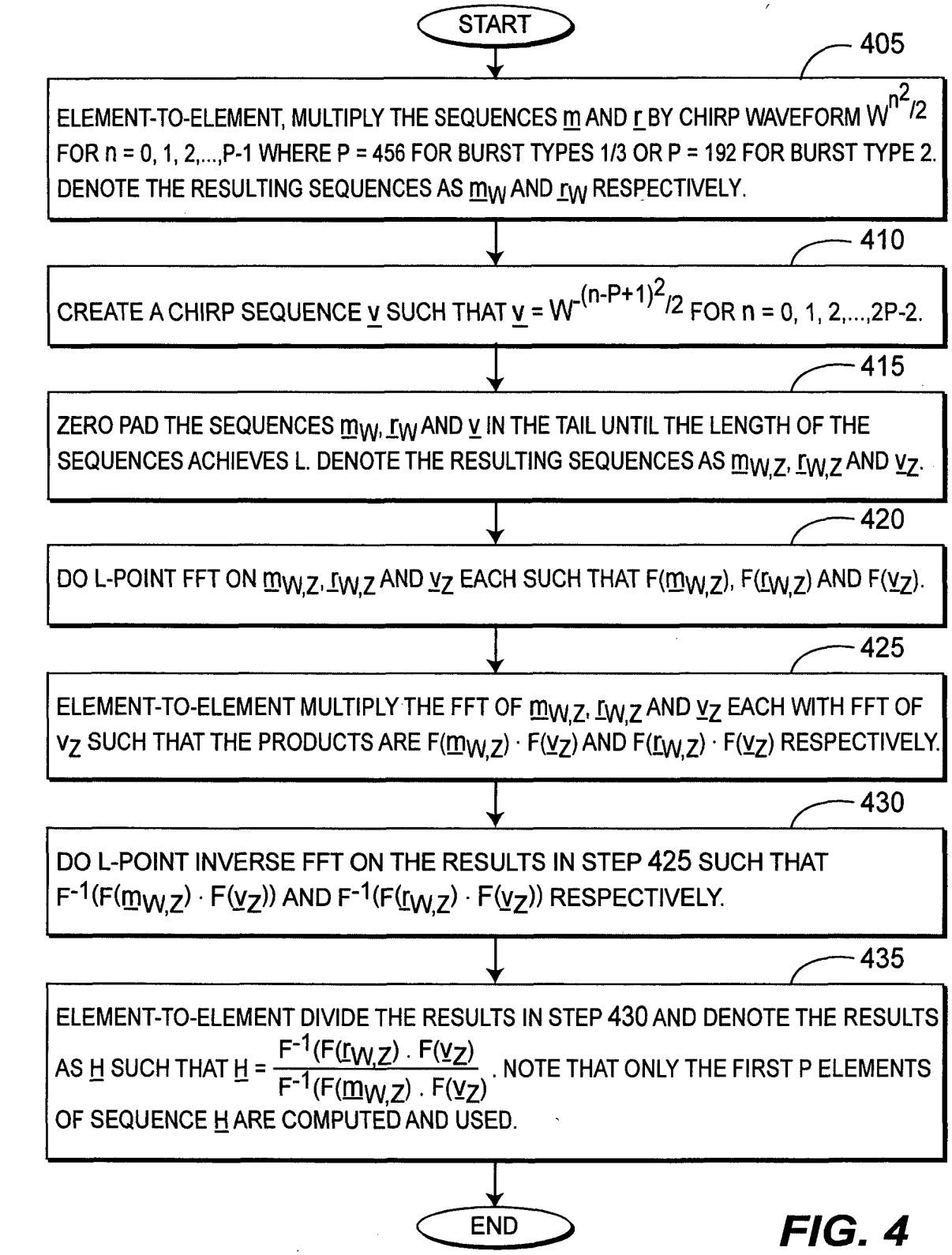
START
405
ELEMENT-TO-ELEMENT, MULTIPLY THE SEQUENCES m AND r BY CHIRP WAVEFORM $W^{n^2/2}$ FOR n = 0, 1, 2,...,P-1 WHERE P = 456 FOR BURST TYPES 1/3 OR P = 192 FOR BURST TYPE 2. DENOTE THE RESULTING SEQUENCES AS m_W AND r_W RESPECTIVELY.
410
CREATE A CHIRP SEQUENCE v SUCH THAT $v = W^{-(n-P+1)^2/2}$ FOR n = 0, 1, 2,...,2P-2.
415
ZERO PAD THE SEQUENCES m_W, r_W AND v IN THE TAIL UNTIL THE LENGTH OF THE SEQUENCES ACHIEVES L. DENOTE THE RESULTING SEQUENCES AS $m_{W,Z}$, $r_{W,Z}$ AND v_Z.
420
DO L-POINT FFT ON $m_{W,Z}$, $r_{W,Z}$ AND v_Z EACH SUCH THAT $F(m_{W,Z})$, $F(r_{W,Z})$ AND $F(v_Z)$.
425
ELEMENT-TO-ELEMENT MULTIPLY THE FFT OF $m_{W,Z}$, $r_{W,Z}$ AND v_Z EACH WITH FFT OF v_Z SUCH THAT THE PRODUCTS ARE $F(m_{W,Z}) \cdot F(v_Z)$ AND $F(r_{W,Z}) \cdot F(v_Z)$ RESPECTIVELY.
430
DO L-POINT INVERSE FFT ON THE RESULTS IN STEP 425 SUCH THAT $F^{-1}(F(m_{W,Z}) \cdot F(v_Z))$ AND $F^{-1}(F(r_{W,Z}) \cdot F(v_Z))$ RESPECTIVELY.
435
ELEMENT-TO-ELEMENT DIVIDE THE RESULTS IN STEP 430 AND DENOTE THE RESULTS AS H SUCH THAT $H = \frac{F^{-1}(F(r_{W,Z}) \cdot F(v_Z)}{F^{-1}(F(m_{W,Z}) \cdot F(v_Z)}$. NOTE THAT ONLY THE FIRST P ELEMENTS OF SEQUENCE H ARE COMPUTED AND USED.
END

FIG. 4

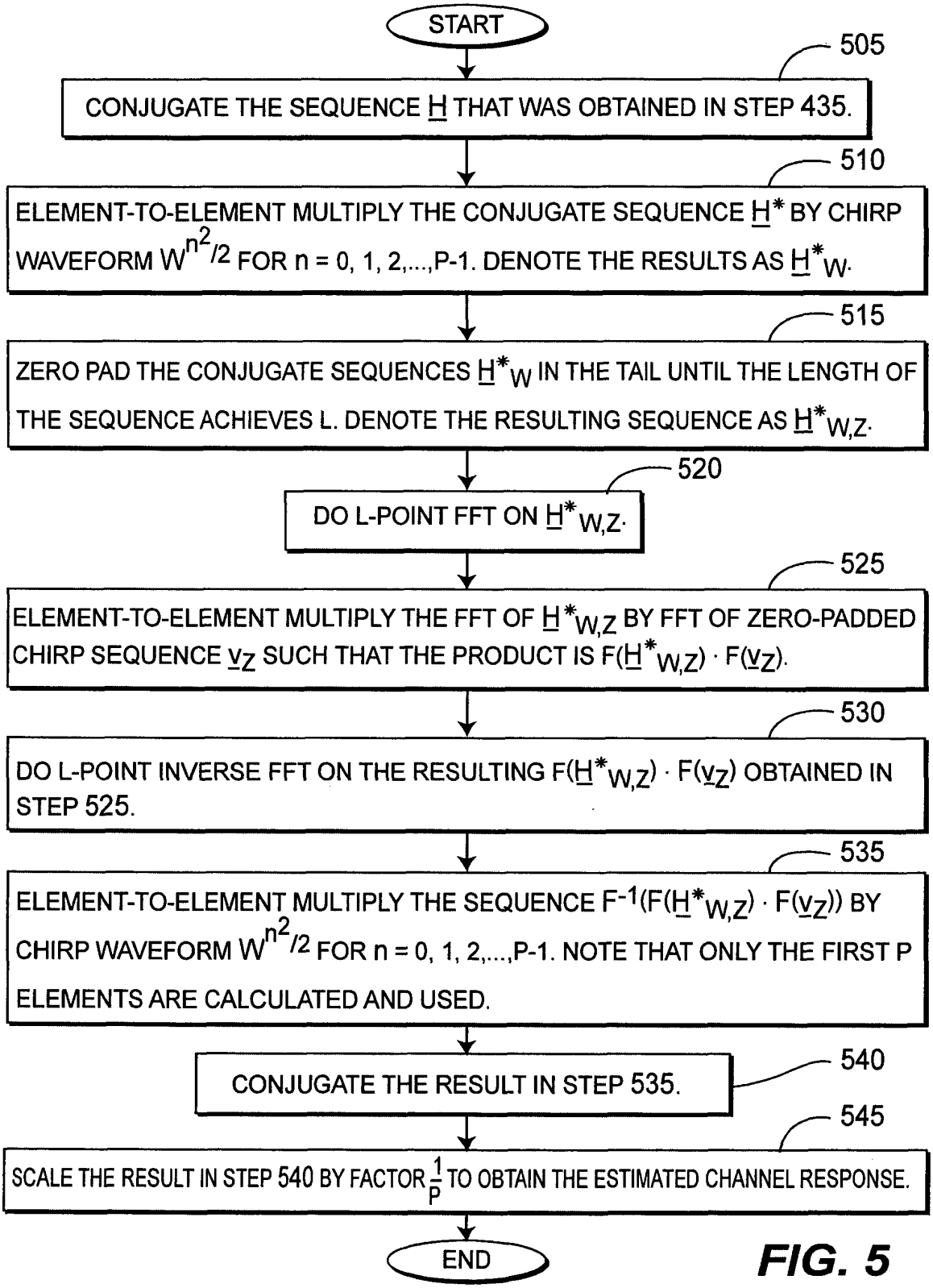
START
505
CONJUGATE THE SEQUENCE $\underline{H}$ THAT WAS OBTAINED IN STEP 435.
510
ELEMENT-TO-ELEMENT MULTIPLY THE CONJUGATE SEQUENCE $\underline{H}^*$ BY CHIRP WAVEFORM $W^{n^2/2}$ FOR n = 0, 1, 2,...,P-1. DENOTE THE RESULTS AS $\underline{H}^*_W$.
515
ZERO PAD THE CONJUGATE SEQUENCES $\underline{H}^*_W$ IN THE TAIL UNTIL THE LENGTH OF THE SEQUENCE ACHIEVES L. DENOTE THE RESULTING SEQUENCE AS $\underline{H}^*_{W,Z}$.
520
DO L-POINT FFT ON $\underline{H}^*_{W,Z}$.
525
ELEMENT-TO-ELEMENT MULTIPLY THE FFT OF $\underline{H}^*_{W,Z}$ BY FFT OF ZERO-PADDED CHIRP SEQUENCE $\underline{v}_Z$ SUCH THAT THE PRODUCT IS $F(\underline{H}^*_{W,Z}) \cdot F(\underline{v}_Z)$.
530
DO L-POINT INVERSE FFT ON THE RESULTING $F(\underline{H}^*_{W,Z}) \cdot F(\underline{v}_Z)$ OBTAINED IN STEP 525.
535
ELEMENT-TO-ELEMENT MULTIPLY THE SEQUENCE $F^{-1}(F(\underline{H}^*_{W,Z}) \cdot F(\underline{v}_Z))$ BY CHIRP WAVEFORM $W^{n^2/2}$ FOR n = 0, 1, 2,...,P-1. NOTE THAT ONLY THE FIRST P ELEMENTS ARE CALCULATED AND USED.
540
CONJUGATE THE RESULT IN STEP 535.
545
SCALE THE RESULT IN STEP 540 BY FACTOR $\frac{1}{P}$ TO OBTAIN THE ESTIMATED CHANNEL RESPONSE.
END

FIG. 5